Breeding for Challenging Times

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What is challenging?

- More extreme climate: temperatures, rainfall and droughts
- Deterioration of coastal seawater quality
- Increase prevalence and diversity of pathogens
- Increase disease caused by synergies of two or more pathogens
- Record low farm gate prices

Linkage of certain disease **Tolerance/Robustness** to **Growth** has been problematic

	CP Turbo	CP Kong
Days to 30 grams	29	21
HSP 70	100%	115%
Pro PO	100%	150%

	CP Turbo	CP Kong
EHP Survival	85	90
EHP + Vibrio	35	46
WSSV	40	65
APHNS	75	58

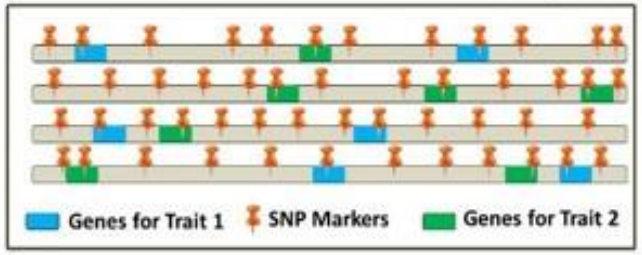
Moving from Family Selection to Individual selection (WSSV, EHP, Robustness)

- **Individual selection always is more powerful than family; able to select low heritability traits like disease tolerance/ robustness characteristics**

First assembled shrimp genome

Increase robustness through selective Genetics/ family and individuals

Classic challenge provides Inputs to develop multi trait SNP chips



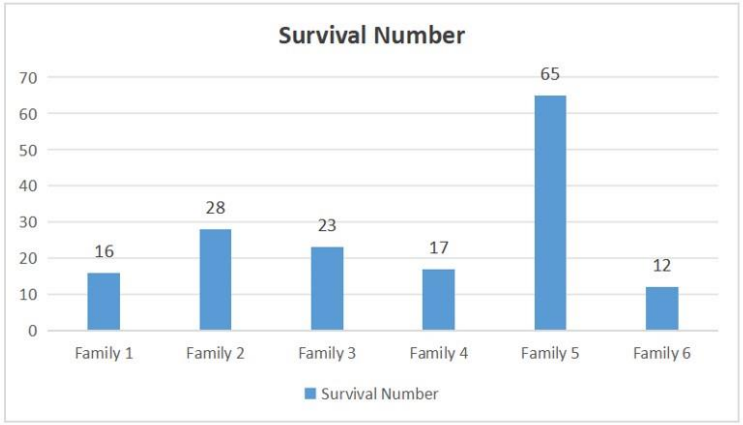
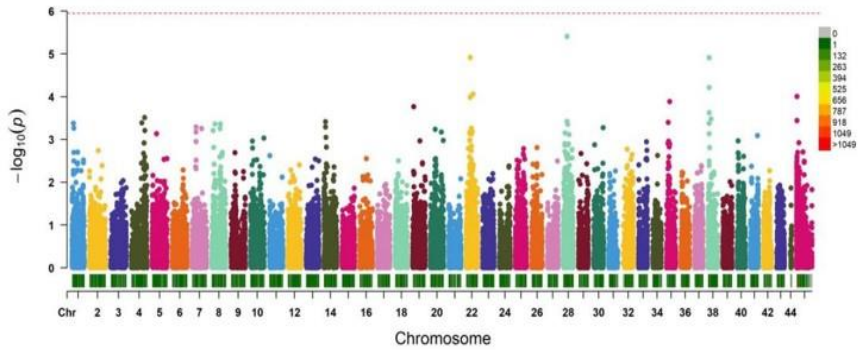


Figure 2. Number of surviving individuals in the six remaining families



Has Nutrition kept up with changes in Shrimp Genetics?

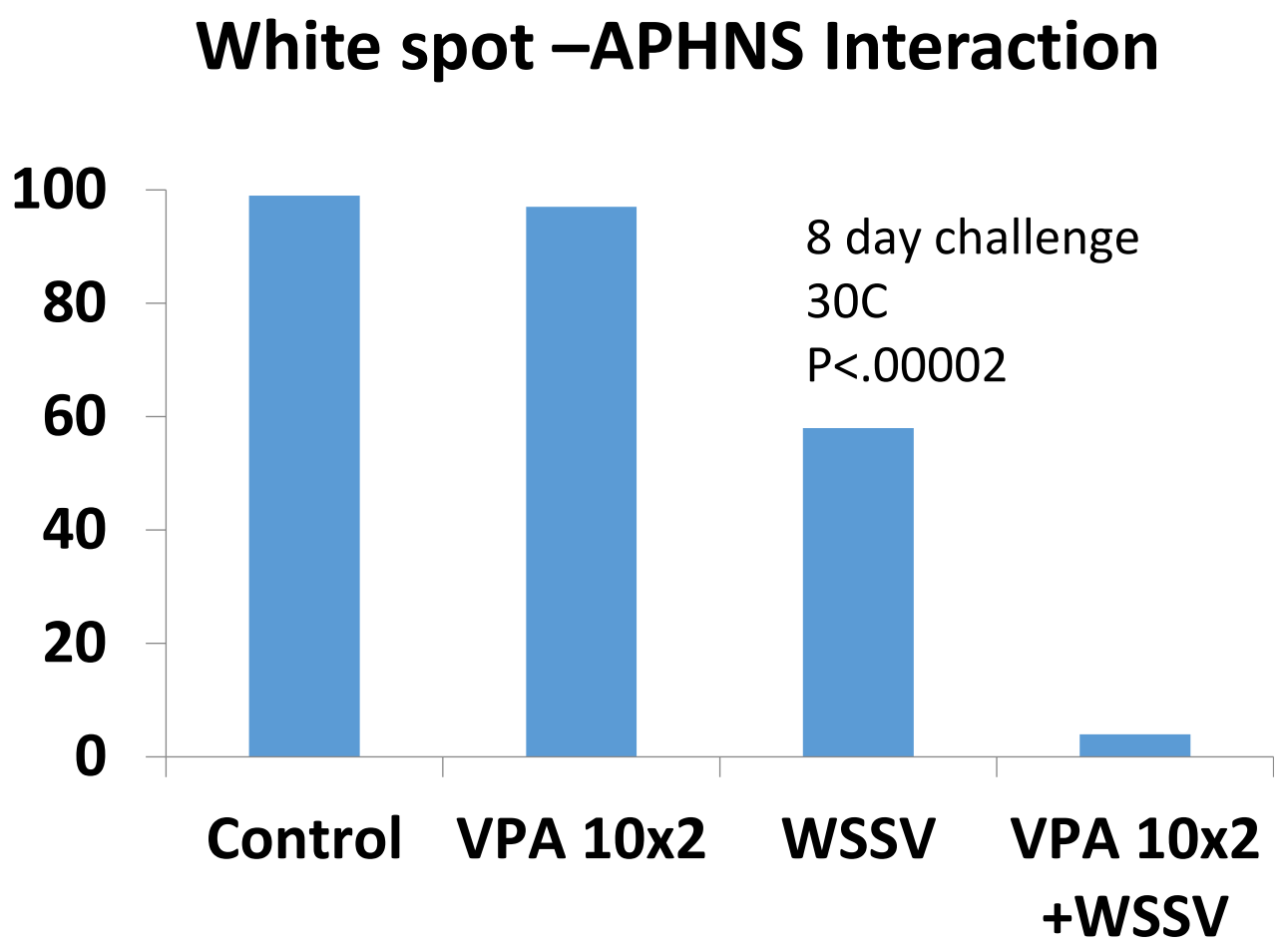
Nutrition effects more than just growth; but most nutrition studies are carried out measuring growth, FCR and survival under non challenging conditions

Fast growth formulas to optimize growth and Immune function

	CP Turbo Fast Growth		CP Kong Moderate Growth	
	Commercial	Advanced	Commercial	Advanced
MBW 30 day (g)	8.8	10.7	5.5	8.5
Survival Rate (%)	83	87	94	94
HSP 70 ug/ml	125	210	135	220
Pro PO ug/ml	100	280	140	300
Survival WFD (%)	33	45	45	60

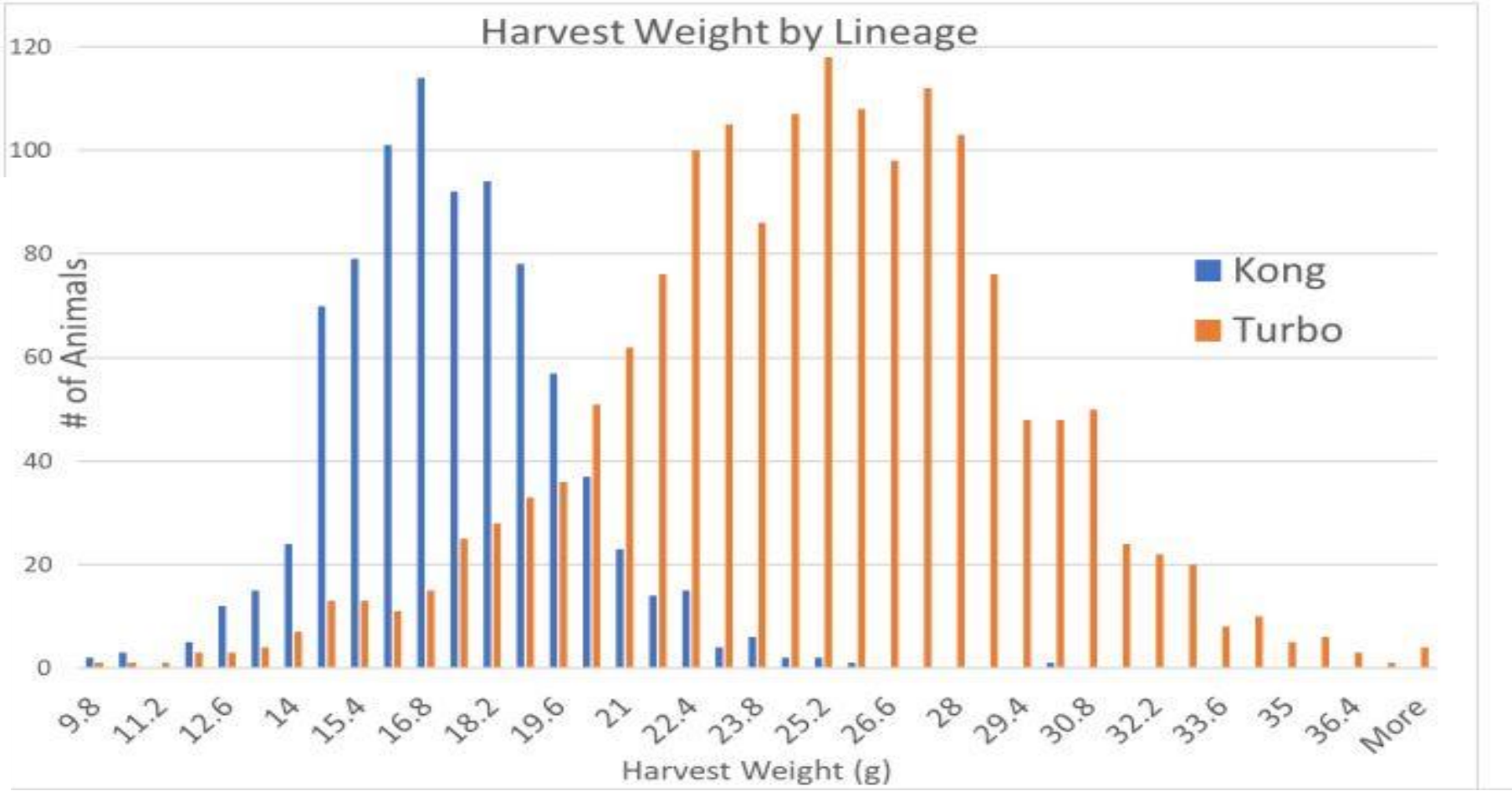
How to select for multiple pathogen diseases Synergies

15 Day Challenge	Survival %	Growth ADG
VP WFD $x10^6$	95	0.25
VP WFD $x10^6$ + 15 ppm $N0_2$	80	0.23
EHP x 10^5	85	0.17
EHP $x10^5$ + VP WFD 10^6	40	0.10



How to select for Robustness?

We must define to make selection criteria



Identifying successful families from actual ponds